DEVICE FOR MEASUREMENT OF MACHINE TOOLS

Background of the Invention

Field of the Invention

[0001] The invention relates to a device for precision measurement of machine tools.

Description of Related Art

[0002] The conventional measurement of machine tools uses, among other measurement devices, optical measurement means that measure based upon interferometry, and are, therefore, comparatively expensive.

Summary of the Invention

[0003] An object of the invention is to provide a measurement tool that is equally suited, in qualitative terms, for precision measurements, that is simpler to use and that is distinctly more favorable with regard to expense and production costs.

[0004] This object is achieved with a device for measuring machine tools, that comprises a housing, a power supply, a clamping cylinder or pin, a light beam transmitter for producing a light beam, a beam splitter, a combined exit/entrance window, and an optoelectronic target which can be read out two-dimensionally.

[0005] In accordance with an exemplary embodiment of the present invention, at least two combined transmitter/receivers are provided that are identical structurally and employed to perform a measurement task to be carried out on a machine tool. The identical configuration of the transmitter/receiver yields major cost advantages during the production phase of these articles.

[0006] The present invention is described in greater detail below with reference to the accompanying drawings.

Brief Description of the Drawings

[0007] Fig. 1 is a schematic plan view of a device for measurement of machine tools in accordance with an exemplary embodiment of the present invention; and

[0008] Fig. 2 shows mounting of the device of the present invention on a machine tool.

Detailed Description of the Invention

[0009] As illustrated in the figure, the present invention comprises several transmitter/receivers 20, 120, 220, that have a housing that is equipped on one side with a Morse cone or a clamping cylinder 10, 10', 10". Through use of the Morse cone or clamping cylinder, the transmitter/receivers 20, 120, 220 can be held or clamped onto a spindle of a machine tool (not illustrated). Additionally, a battery-operated power supply (not shown), a light emitting or laser diode 12, 12' and 12" and collimation optics 14, 14' and 14" are advantageously provided within the clamping cylinder 10, 10', 10". With these components, a narrowly masked light beam (e.g., a laser beam) can be produced. Laser beam 13, 13', 23, 33, produced in this manner, can be used to illuminate an electronic target 30, 30', 30", which can be read out two-dimensionally. The signals delivered from such a target based upon the laser beam's illumination, therefore, represents the incidence site of the laser beam and can be used to perform various two-dimensional measurements of the machine tool.

[0010] If, in accordance with an exemplary embodiment of the invention, two transmitter/receivers 20, 120 are each held by several spindles of a like number of machine tools, only with completely aligned and precision-guided machine tools will a laser beam 13, which has been generated by a laser diode 12 hit the center of the target 30' through the first beam splitter or splitter mirror 15 and the second splitter mirror 15'. The same applies to the laser beam 13' produced by the other laser diode and its impact point on the target 30. Ideally, the two laser beams would coincide. Deviations are registered by participating sensors of the target based upon providing a read out of two coordinates at a time with high precision in the submicron range. Deviations can be detected both with respect to the parallel offset of the spindles and also for the angular offset of the spindles.

[0011] The incidence of outside light on the target 30, 30' is reduced by filter

windows 18, 18' which are matched to the wavelength range of the laser light that is employed.

[0012] As is shown in the bottom part of the figure, by providing another filter window 16, 16", the measurement device, in accordance with another exemplary embodiment of the invention, can be used in a much more versatile manner. For example, this measure makes it possible to additionally check the kinematics of another spindle (e.g., with the addition of yet another transmitter/receiver 220) and the possibility of a direction of movement for a tool. In this manner, light beams can be advantageously used as measurement points that hit pertinent different targets.

[0013] These measurement devices, in accordance with yet another exemplary embodiment of the invention, can be pushed, tilted or turned in all axes of space relative to one another in a diverse manner to perform the intended measurement task.

[0014] Fig. 2 shows mounting of the device of Fig. 1 on a machine tool M having tracks T in each of which a pair of spindles (not shown) are movable.